

**KANISKA MALLICK**  
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## **Education**

- **Ph.D., University of Pune (Research on Hydrology, Department of Environmental Sciences)**, India, Place of research: Space Applications Centre, Indian Space Research Organization, Ahmedabad, June 2008.  
*Thesis: Characterizing Moisture Availability and Actual Evapotranspiration Using Space Based Remote Sensing Techniques*
- **M.Sc., Agricultural Meteorology**, September 2001  
Punjab Agricultural University, Ludhiana, India  
*Thesis: A comparative study of rice yield prediction using statistical and dynamic simulation modeling techniques*
- **B.Sc., Agricultural Sciences**, March 1999  
Bidhan Chandra Krishi Vishwavidyalaya, West Bengal, India

## **Research Interests**

Multi-scale modeling of land surface fluxes / hydrology using remote sensing observations from imager/radiometer and sounder in optical-thermal (Polar & Geostationary) and Microwave bands; Quantifying land-atmosphere interaction using Earth observation sounder and imager derived fluxes; Land use/land cover dynamics and hydro-climatology

## **Research and Professional Experience**

- **Research Scientist (postdoc), Water and Carbon Cycle Group, Jet Propulsion Laboratory, NASA, California Institute of Technology, August 2011 till date**  
Development and comparison of evapotranspiration algorithms to evaluate earth system models.

- **Post-doctoral Research Associate, NERC (Natural Environment Research Council), Lancaster Environment Centre, Lancaster University, UK, September 2008 to July 2011**

Established a protocol for partitioning of eddy-covariance terrestrial latent heat flux observation into wet evaporation and transpiration through dynamic simulation as well as using this information in conjunction with simultaneous observations of CO<sub>2</sub> uptake to attempt to resolve how plant communities invest the resources they acquire when their environment is unpredictable.

Developed a methodology for estimating land surface wetness using passive microwave remote sensing observation from AMSR-E platform and evaluated them for a wide range of biome classes covering FLUXNET eddy covariance sites, which will be used for terrestrial latent heat flux partitioning and also as a cloud proof measure of surface energy balance index.

Developed and implemented model code for retrieving non-parametric latent heat flux, near surface energy balance fluxes, boundary layer conductance and surface (stomatal) conductance from Earth observation sounder-imager data from AIRS-AMSU and MODIS platforms, and evaluated these retrievals against FLUXNET eddy covariance observational data to ultimately quantify the land-atmosphere interaction and evaluate or improve the land surface parameterization of weather forecasting models (e.g., WRF).

Developed model for retrieving clear and cloudy sky net radiation using Earth observation land surface and atmospheric data from MODIS 5km database to study over Southern Great Plains during CLASIC 2007 campaign.

- **Visiting Researcher, Department of Earth and Atmospheric Sciences, Purdue University (Invited) (1 October 2010 – 2 November 2010), with Prof. Dev Niyogi**

Comparing satellite sounder derived land surface fluxes and conductances with LDAS over Southern Great Plains (SGP) during CLASIC 2007 experiment and under different hydrothermal conditions; Retrieval of surface fluxes over SGP from AIRS sounding observations and comparison with MODIS based fluxes using optical-thermal radiometry; Comparison between sounder flux; imager flux from Indian geostationary sensor and LDAS flux over Indian monsoon domain.

- **Research Associate, Space Applications Centre, ISRO, India, June 2008 to September 2008.**

Modelling energy and water exchange in vegetative systems using measurements and satellite observations. Time series analysis of basic land surface parameters (NDVI, albedo, LST) using NOAA PAL (20 years datasets) and MODIS (2002 to current) data to characterize vegetation vulnerable zones, hotspots.

- **Senior Research Fellow, Space Applications Centre, ISRO, India, September 2005 to May 2008 (ISRO PhD fellowship for Geostationary satellite based Energy and Water Balance Modeling).**

Developed satellite-based modeling techniques for evapotranspiration and soil moisture estimation using polar orbiting and geostationary satellite (INSAT/Kalpana-1) sensors (VHRR) with special emphasis over Indian agroecosystems and validated these over diverse hydrometeorological conditions.

- **Junior Research Fellow, Space Applications Centre, Indian Space Research Organization, Ahmedabad, India, September 2003 to September 2005**

Energy and water balance modeling using polar orbiting, geostationary satellite and observational data for agroecosystems applications and growing environment characterization.

### **Research publications (11 published, 3 in preparation)**

#### ***Submitted (/in preparation) (3)***

1. Jarvis AJ and **Mallick K** (2011). A numerical scheme for partitioning terrestrial eddy covariance latent heat observations into evaporation and transpiration (in prep. for ***Global Change Biology***).
2. **Mallick K** and Jarvis AJ (2011). A cloud-proof satellite surface wetness index based on day-night microwave brightness temperature differences. ***Journal of Hydrology (in preparation)***.

#### ***Published and accepted (11)***

3. Bhattacharya BK, **Mallick K**, Nigam R, Dakore KK, Sheikh AM and Patel NK (2011). Efficiency based wheat yield prediction in a semi-arid climate using surface energy budgeting with satellite observations, ***Agricultural and Forest Meteorology***, 151 (10), 1394 – 1408.
4. Jarvis AJ, **Mallick K**, Wohlfahrt G, Gough C, Hirano T, Kiely G, Miyata A, and Yamamoto S (2010). Components of near-surface energy balance derived from satellite soundings: i. Net available energy. ***Atmospheric Chemistry and Physics Discuss***, 10, 14387–14415.
5. **Mallick K**, Jarvis AJ, Wohlfahrt G, Gough C, Hirano T, Kiely G, Miyata A, and Yamamoto S (2010). Components of near- surface energy balance derived from satellite soundings: ii. latent heat flux. ***Atmospheric Chemistry and Physics Discuss***, 10, 14417–14443).
6. Bhattacharya BK, **Mallick K**, Patel NK, and Parihar JS (2010). Regional clear sky evapotranspiration using remote sensing data from Indian geostationary meteorological satellite. ***Journal of Hydrology***, 387, 65 – 80.
7. **Mallick K**, Bhattacharya BK, and Patel NK (2009). Estimating volumetric surface moisture content for cropped soils using a soil wetness index based on surface temperature and NDVI. ***Agricultural and Forest Meteorology***, 149 (8), 1327 – 1342.

8. **Mallick K**, Bhattacharya BK, Rao VUM, Reddy DR, Banerjee S, Hoshali V, Pandey V, Kar G, Mukherjee J, Vyas SP, Gadgil AS, and Patel NK (2009). Latent heat flux estimation in clear sky days over Indian agroecosystems using noontime satellite remote sensing data. *Agricultural and Forest Meteorology*, **149 (10)**, 1646 – 1665.
9. Bhattacharya BK, **Mallick K**, Padmanavan N, Patel NK, and Parihar JS (2009). Retrieval of land surface albedo and temperature using data from the Indian geostationary satellite: a case study for the winter months. *International Journal of Remote Sensing*, **30 (12)**, 3239 – 3257.
10. Sarkar C, Bhattacharya BK, Gadgil A, **Mallick K**, Patel NK, and Parihar JS (2008). Estimation of relative evapotranspiration from NOAA PAL to derive grow characteristics in India. *International Journal of Remote Sensing*, **29 (11)**, 3271-3293.
11. Bhattacharya BK, **Mallick K**, Rao VUM, Raji Reddy D, Banerjee S, Hoshali V, Pandey V, Kar G, Mukherjee J, Vyas SP, and Patel NK (2008). Regional scale evapotranspiration from MODIS AQUA and NOAA AHRR: Validation over Indian Agroecosystems. *Journal of Agrometeorology (special issue)*, **10, part II**, 372 – 383.
12. Nigam R, **Mallick K**, Bhattacharya BK, Pandey V, and Patel NK (2008). Heat flux estimation from MODIS satellite and validation over a semi-arid agroecosystem using scintillometry and model simulation. *Journal of Agrometeorology (special issue)*, **10, part II**, 75 – 81.
13. Aich Bhowmick S, Bhattacharya BK, **Mallick K**, and Nigam R (2008). Retrieval of near surface air temperature in clear skies using Indian geostationary satellite data. *Journal of Agrometeorology (special issue)*, **10, part II**, 545 – 556.
14. **Mallick K**, Bhattacharya BK, Chourasia S, Dutta S, Nigam R, Mukherjee J, Banerjee S, Kar G, Rao VUM, Gadgil AS, and Parihar JS (2007). Evapotranspiration using MODIS data and limited ground observations over selected agroecosystems in India. *International Journal of Remote Sensing*, **28 (10)**, 2091-2110.

#### ***Seminar/Symposium proceedings (3)***

1. Dakhore KK, Bhattacharya BK, **Mallick K**, Nigam R, Patel NK, Pandey V, Karande BI, and Shekh AM (2009). Energy budget over semi-arid agro-ecosystem using satellite data. In: *ISPRS Archives XXXVIII-8/W3 Workshop Proceedings: Impact of Climate Change on Agriculture* held between December 17-18, 2009 at Space Applications Centre, ISRO, Ahmedabad, India.
2. Sarkar C, Bhattacharya B, Gadgil A, **Mallick K**, Bairagi GD, Patel NK, and Parihar JS (2006). Growing environment characterization of rice and yield prediction using time composited NOAA AVHRR optical and thermal data. In: *International Society of Photogrammetry and Remote Sensing Symposium* held between December 23-26, 2006 at Goa, India, Commission VI, WG VI/4, No. ICWG-24-030.

3. Bhattacharya BK, Padmanabhan N, **Mallick K**, Patel NK, and Parihar JS (2007). Retrieval of radiation budget parameters for agrometeorological applications using KALPANA-1 VHRR data. In: *KALPANA-1 50 months proceedings of seminar on mid-term appraisal of technology, operation & applications*, held in January 2007 at ISAC, Bangalore, India, pp. 111-117.

### ***Abstracts***

1. Aich Bhowmick, S., Bhattacharya, B.K., **Mallick, K.**, & Nigam, R. (2008). Retrieval of near surface air temperature in clear skies using Indian geostationary satellite data (abstract). International Symposium on Agrometeorology and Food Security, 18-21 February 2008, Hyderabad, India, 235.

### **Seminars, Symposium presentation:**

1. Mallick K and Jarvis A J (2010), Satellite-only latent heat flux estimation, Remote Sensing and Hydrology 2010 Symposium 2010 to be held in Jackson Hole, Wyoming, USA (to attend), 27 – 30 September 2010.
2. Jarvis A J and Mallick K (2010), Global surface wetness fields derived from AMSR-E day-night brightness temperature differences, Remote Sensing and Hydrology 2010 Symposium 2010 to be held in Jackson Hole, Wyoming, USA (to attend), 27 – 30 September 2010.
3. JULES International Workshop at Indian Institute of Tropical Meteorology, Pune, India, March 2008.
4. Indian Society of Remote Sensing Annual Symposium, Birla Institute of Technology, Ranchi, India, 19 – 21 December 2005.

### **Fellowship, honour and awards**

- Awarded **NERC (Natural Environment Research Council) postdoctoral research fellowship** from September 2008 to till date at Lancaster Environment Centre, Lancaster University, United Kingdom.
- Awarded **Senior Research Fellowship (SRF)** from **Space Applications Centre (SAC), ISRO** since September 2005 to September 2008.
- Awarded **Junior Research Fellowship (JRF)** from **Space Applications Centre (SAC), ISRO** since September 2003 to September 2005.
- Awarded **Junior Research Fellowship (JRF)** from **Indian Council of Agricultural Research** in **Agricultural Meteorology** during **1999 to 2001** for carrying out M.Sc. degree.

- Recipient of **best oral paper presentation award** in Indian Society of Remote Sensing Annual Symposium, Birla Institute of Technology, Ranchi, India, 19 – 21 December 2005.

## **Research affiliation**

FLUXNET Research Network

## **Skills**

***Spatial Data:*** Expertise in working with Earth observation datasets such as ASTER, time-series MODIS (2002 to current), NOAA PAL (1981 to 2001), AIRS-AMSU suite, TRMM rainfall, GPCP rainfall, Indian Geostationary (KALPANA1-VHRR), Meteosat Geostationary satellite optical and thermal data, time series passive microwave (AMSR-E) data

***Eddy covariance and scintillometer data:*** Expertise in modeling eddy covariance hydrometeorological fluxes across different biomes; experience in Large Aperture Scintillometer (LAS) flux analysis

***Programming:*** Proficiency in **MATLAB programming**, working with 3 dimensional time series Earth observation data of various formats (**HDF-4, HDF-5, NetCDF etc**).

## **Teaching & Service:**

**Teaching:** Assisted in training during UN sponsored Post-Graduate Diploma Course on ‘Satellite Meteorology’ at Meteorology and Oceanography Group (MOG) in Space Applications Centre, ISRO, conducted by CSSTE-AP (Centre for Space Science Technology Education – Asia pacific) in Satellite Agrometeorology at postgraduate level.

Co-guiding a PhD student (Louisa Reynolds) for developing her research on ‘Latent heat flux retrieval under cloudy sky conditions using Earth Observation data’

**Peer Review:** Atmospheric research  
Journal of Hydrology  
International Journal of Remote Sensing  
Journal of Indian Society of Remote Sensing

## **Name of referees:**

1. Dr. Andrew Jarvis, Lecturer, Lancaster Environment Centre, Lancaster University, Lancaster, United Kingdom, LA1 4YQ, Tel: +44-1524-593280(O), 07913381742(mobile); Email: [a.jarvis@lancaster.ac.uk](mailto:a.jarvis@lancaster.ac.uk)

2. Dr. Joshua B Fisher, Scientist, Water and Carbon Cycle Group, NASA Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, California, 91109-8099, Email: [jbfisher@jpl.nasa.gov](mailto:jbfisher@jpl.nasa.gov)
3. Dr. Bimal K Bhattacharya, Scientist, Agriculture, Terrestrial Biosphere and Hydrology Group, Space Applications Centre (ISRO), Ahmedabad -380015, Gujarat, India  
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5. Dr. Martha Anderson, Research Physical Scientist, USDA-ARS Hydrology and Remote Sensing Laboratory, 104 Bldg. 007, BARC-West, Beltsville, MD 20705 USA, [martha.anderson@ars.usda.gov](mailto:martha.anderson@ars.usda.gov)
6. Dr. Pradeep Thapliyal, Scientist, Meteorology and Oceanography Group (MOG), Space Applications Centre (ISRO), Ahmedabad -380015, Gujarat, India, Tel: 91-79-26916112 (O); Email: [pradip\\_thapliyal@yahoo.com](mailto:pradip_thapliyal@yahoo.com); [pkthapliyal@sac.isro.gov.in](mailto:pkthapliyal@sac.isro.gov.in)